BROWN AND CALDWELL CONSULTING ENGINEERS

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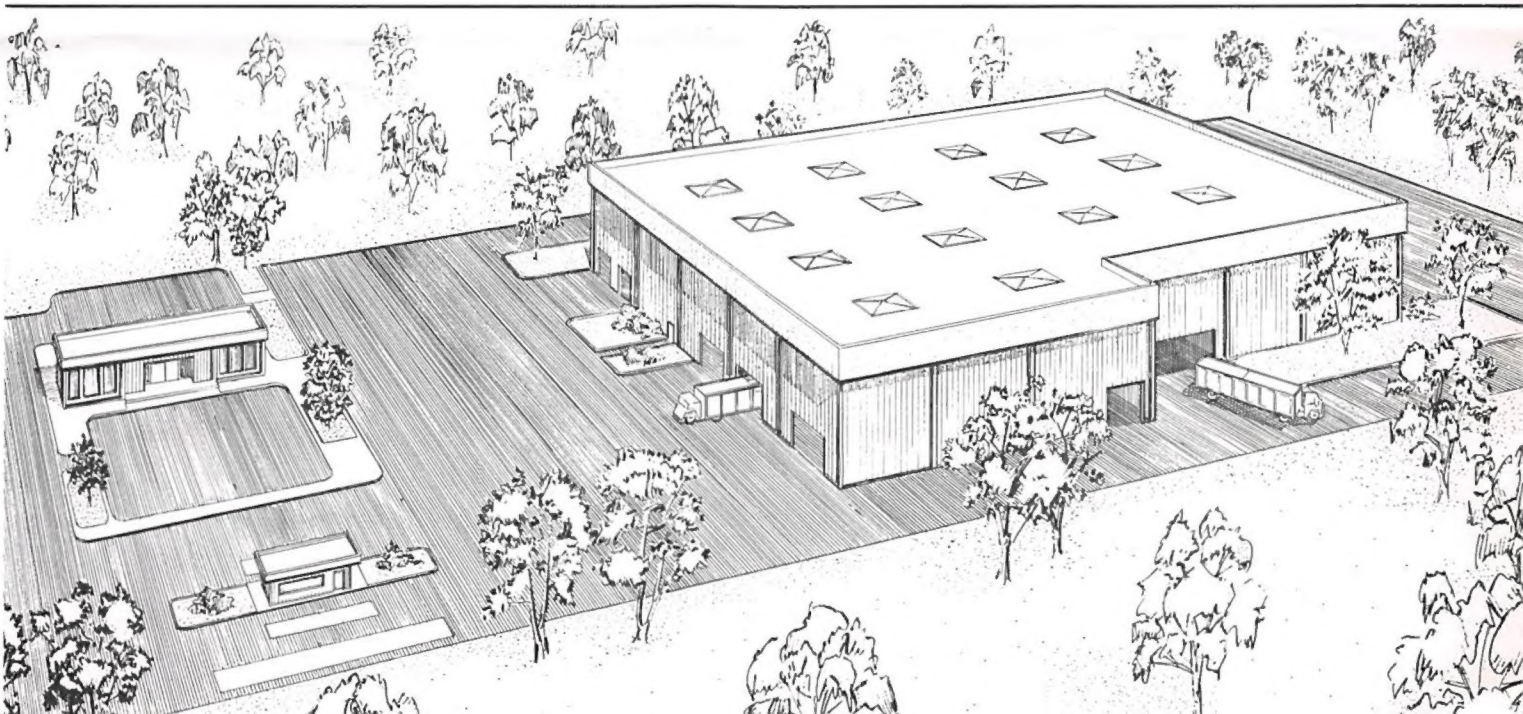
## UNIQUE FACILITY COMBINES SOLID WASTE RESOURCE RECOVERY AND WASTEWATER TREATMENT

**Progress Report No. 1--February 1975**

Brown and Caldwell has completed an eight-month development study that successfully demonstrates that solid waste resource recovery can be combined with wastewater treatment in a unique reclamation facility. The investigation was undertaken for the Central Contra Costa Sanitary District to determine if the District's 775 tons a day of municipal solid waste could be used to fuel its new Water Reclamation Plant now under construction near Concord, California. (The new plant, the largest of its type in the West, will recycle domestic sewage as process and cooling water for local industries by 1976.) A recent pilot plant study proved the feasibility of coordinating the disposal of solid waste in Central Contra Costa County with the sludge incineration process of the County's water reclamation plant, thus making the latter virtually energy self-sufficient.



**Artist's concept of resource recovery plant, a dry classification process which will separate ferrous metals and aluminum for resale, with combustible solid waste fraction being incinerated for energy recovery.**

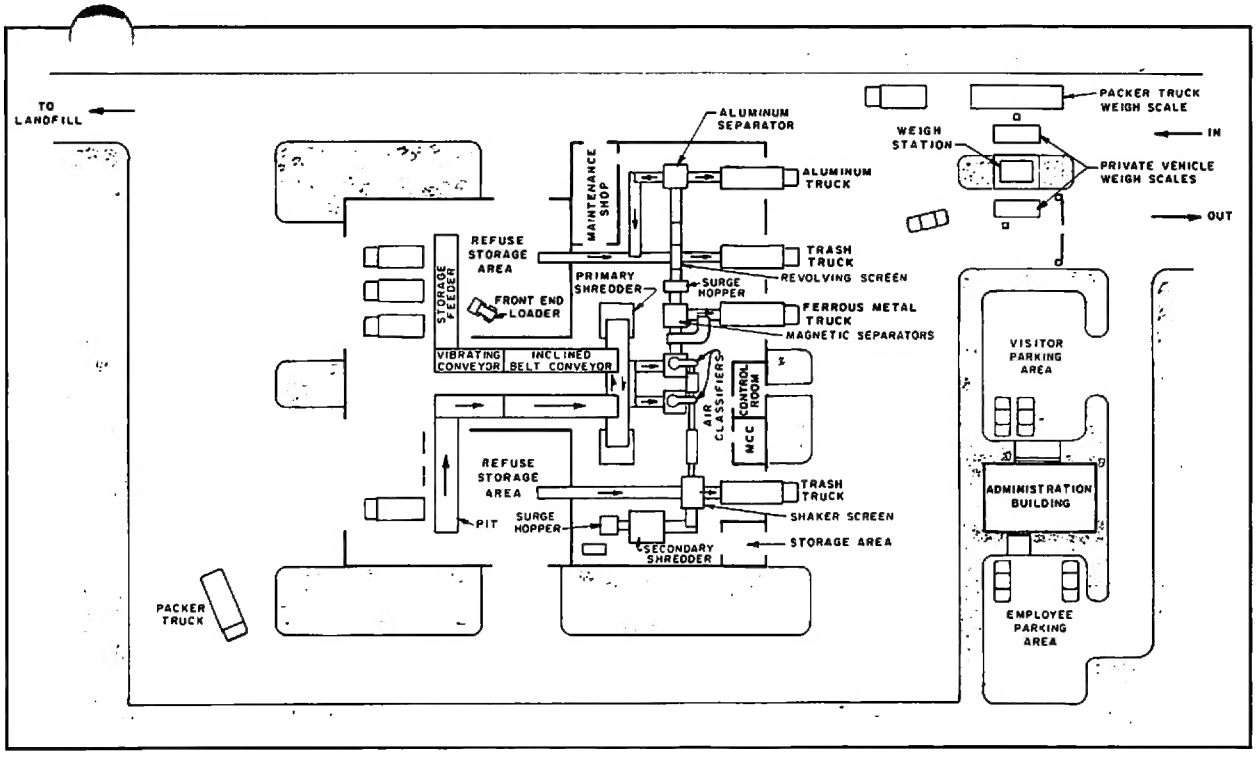



**Figure 1. Plot plan of Resource Recovery Plant located at landfill site. Energy Recovery segment of the plant is physically located at the Water Reclamation Plant.**

## Resource Recovery

According to the hybrid concept, municipal solid waste would be processed in a new resource recovery plant to be located at the present landfill site. This plant is illustrated in the artist's concept on page 1 and in Fig. 1. Ferrous metal, aluminum and a combustible fraction would be economically recovered in this fully mechanized, dry classification type resource recovery plant. The combustible solid waste fraction would then be pneumatically conveyed to the water reclamation plant and provide the fuel for lime recalcination and sludge incineration. The heat in the furnace off-gas is recovered by waste heat boilers to produce steam, which is used to power steam turbine-driven aeration blowers and electrical generators. The balance of the steam is used in the plant heating and chilling systems.

Figure 2 shows the combined flowscheme. The Water Reclamation Plant utilizes a two-stage centrifuge operation followed by multiple hearth furnaces to recycle lime used in the treatment process and to incinerate the waste sludge.

According to the hybrid scheme, most of the solid fuel would be fed to the multiple hearth furnaces for disposal and pyrolysis. A smaller portion would be directed to the second stage centrifuge to improve dewatering efficiency.

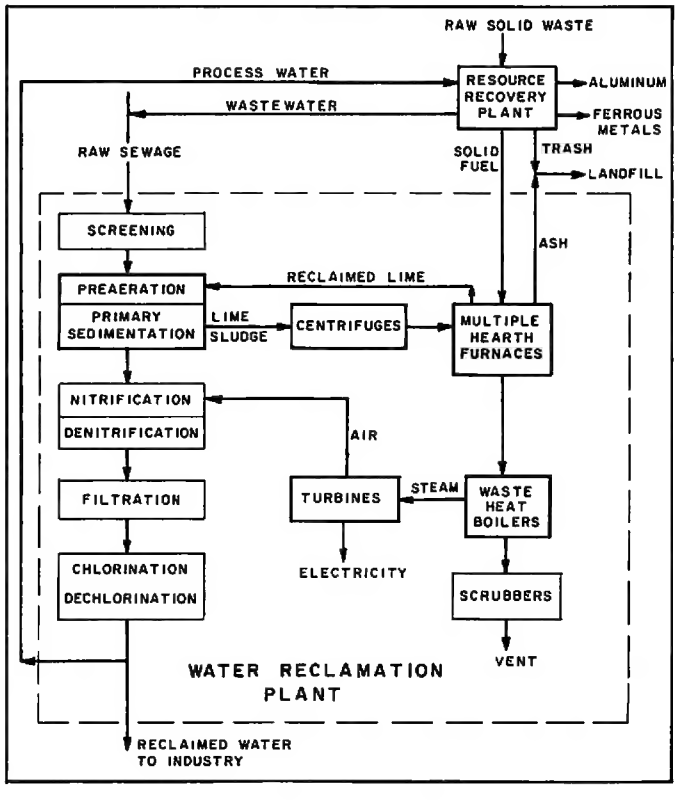
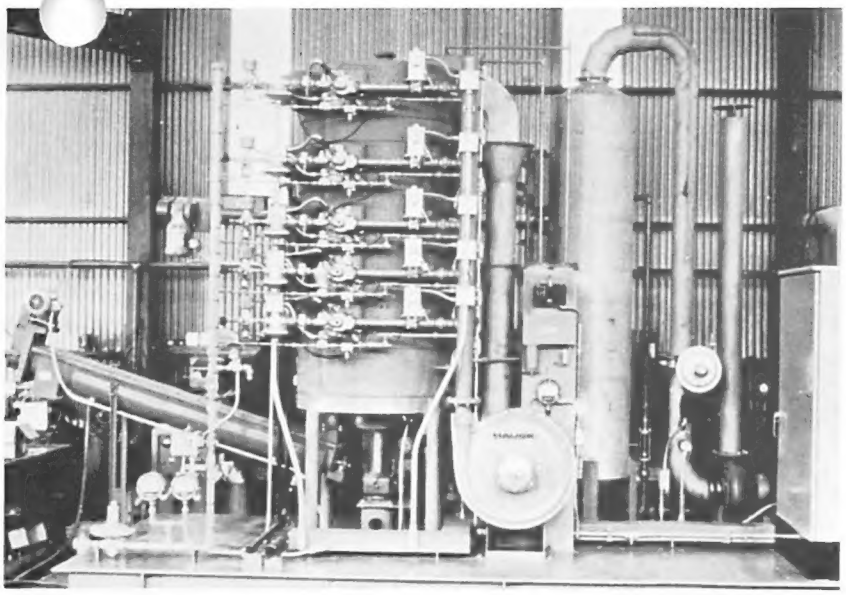



**Figure 2. Combustible fraction (solid fuel) is pneumatically conveyed 1½ miles to Water Reclamation Plant where it is combined with wastewater sludge in three multiple hearth furnaces.**



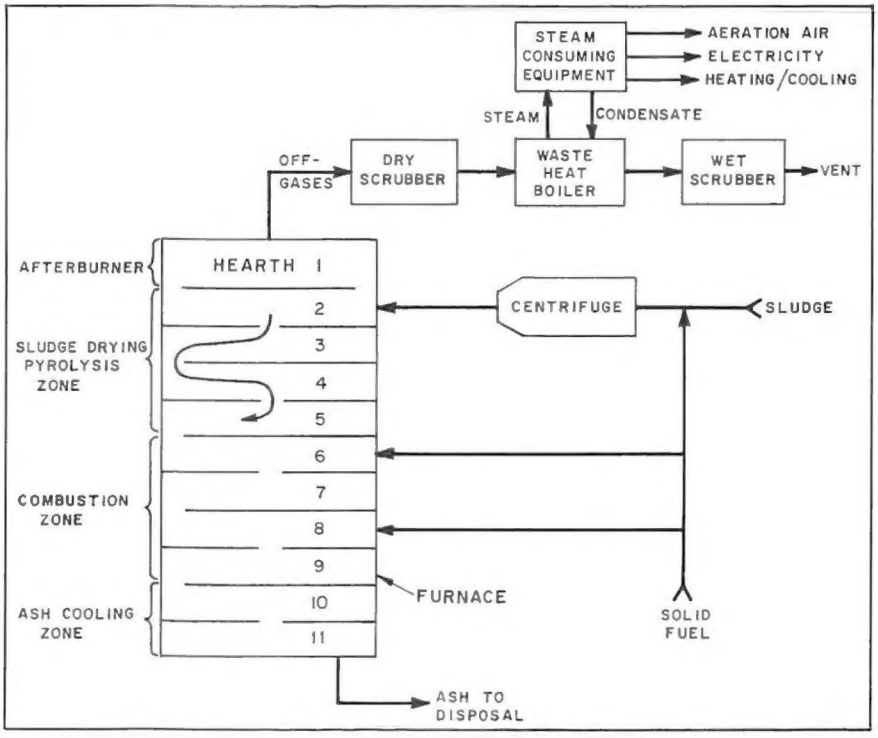
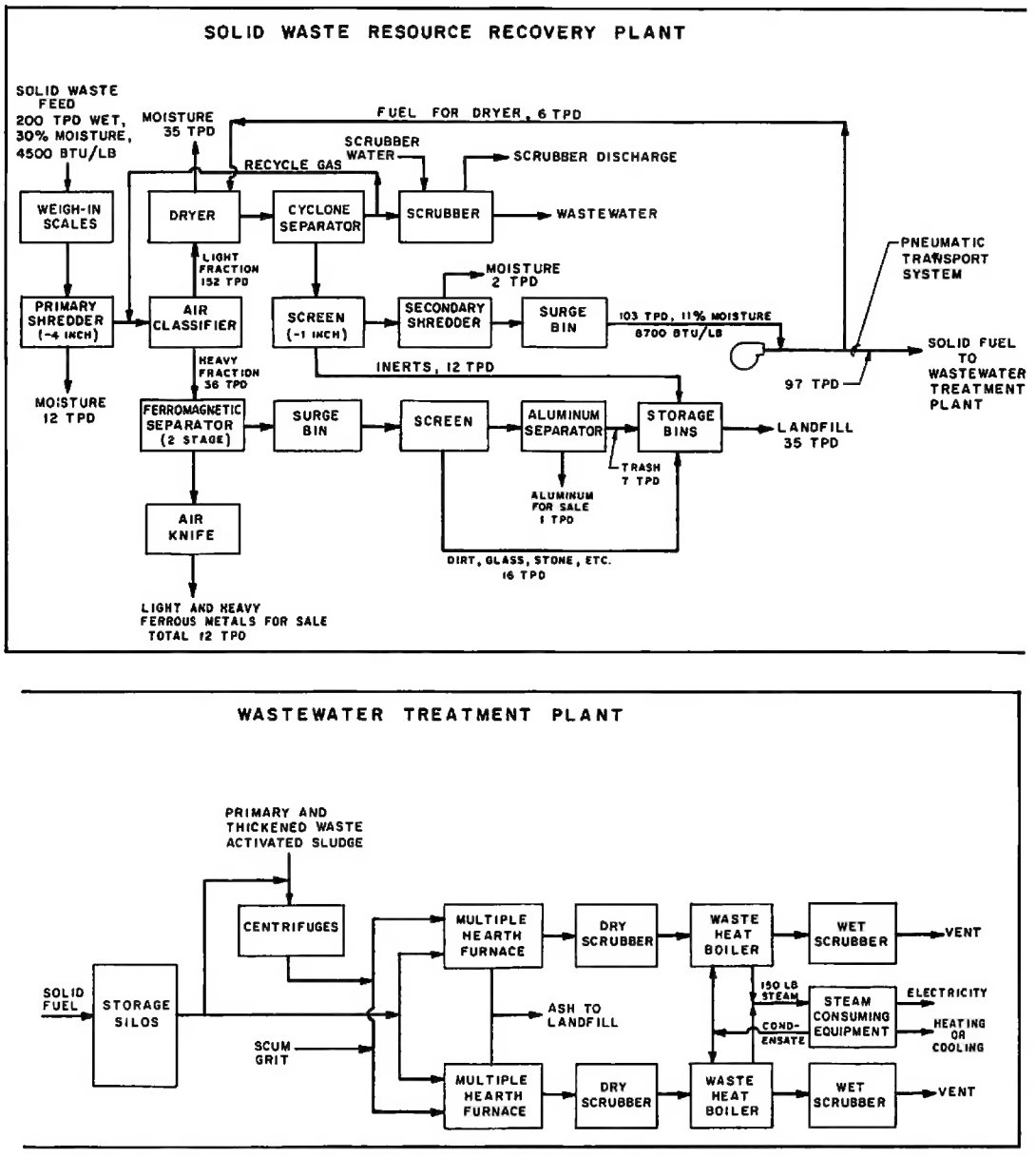



**Figure 3. Envirotech Corporation's multiple hearth test furnace (above) proved the feasibility of incinerating combined wastewater sludge and combustible solid waste. Schematic of furnace at right shows injection points of sludge and the combustible fraction of the solid waste (solid fuel).**

Success of the original concept hinged on whether the solid fuel could be burned efficiently without posing a larger air quality problem. Tests in November, 1974 at Envirotech Corporation's Brisbane, California test facility proved it could. As shown in Figure 3, the bulk of the solid fuel (100 lb per hour) is fed to Hearths No. 6 and 8 in the furnace combustion zone. The furnace drying zone (Hearths 1 through 5) is operated under reduced atmospheric conditions, thus causing some of the organic matter to be pyrolyzed. The pyrolysis gas provides fuel for the afterburner, which raises the off-gas temperature from approximately 800 to 1400$^{o}$ F to assure complete oxidation of residual wastes.

The combined solid waste/sludge incineration step eliminates virtually all external fuel supplies for the furnace, while serving as a convenient disposal mechanism for these wastes. In addition, waste heat is recovered as steam from the furnace off-gases and can be used to drive the aeration blower turbines and electrical generators, as well as for plant heating and cooling. Results of this initial study have proved so successful that the District is seeking funds from the California State Water Resources Control Board and EPA for a full-scale test using an existing multiple-hearth furnace at a nearby wastewater treatment plant.

**Figure 4. Combined solid waste resource recovery and wastewater treatment on a small scale. Block diagram shows how a solid waste feed of 200 tons a day can be used to generate sufficient energy to run both the resource recovery system and the wastewater treatment plant.**




## Portent for Other Utilities

The concept of combining solid waste resource recovery and wastewater treatment in a single facility has application across the country. Figure 4 illustrates the concept on a relatively small scale. Preliminary engineering results show that it is possible to generate 2.8 MW from as little as 200 tons a day of unclassified solid waste. This would be sufficient to supply the complete electrical energy requirements of the combined operation, with recovery and resale of valuable byproducts providing additional revenues. Advantages of the hybrid system are:

1. The wastewater treatment plant and solid waste resource recovery facility would be energy self-sufficient in an era of rising energy prices.

2. There is a direct correlation between wastewater and solid waste generation. Hence, an adequate future supply of solid waste would be assured.

3. The integral facility is superior to a separate resource recovery plant producing electrical power or prepared fuels, since it would not be dependent on an uncertain market and pricing structure.

4. As a combined facility, the solid waste resource recovery portion appears eligible in all or part for construction grant funding from EPA and some state sources.

An update on this work will be presented in the next Progress Report.